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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Junichiro HARA

Title: EXHAUST-HEAT RECOVERY  
SYSTEM FOR ENGINE

Appl. No.: 10/715,107

Filing Date: 11/18/2003

Examiner: Loren C. EDWARDS

Art Unit: 3748

Confirmation 3998

Number:

**SUPPLEMENTAL AMENDMENT**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Prior to continued examination of the present Application pursuant to the Request for Continued Examination (RCE) filed on October 23, 2006, Applicant requests that the application be amended as follows:

Please amend the application as follows:

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Previously Presented) An exhaust-heat recovery system for a vehicle comprising:
  - a catalytic converter configured to let pass exhaust discharged from an engine and to burn catalytically combustible components in the exhaust;
  - an exhaust heat exchanger configured to exchange heat between the exhaust having passed through the catalytic converter and a heat-transfer medium having passed through the engine;
  - an air conditioner with a heat exchanger configured to generate a heating wind by means of the heat exchange between the heat-transfer medium having passed through the exhaust heat exchanger and an air conditioning wind; and
  - an engine controller configured to perform an incremental control for increasing the combustible components in the exhaust to be burned in the catalytic converter by means of changing an operation condition of the engine when a prescribed heating condition is unsatisfied, wherein a performance of the incremental control is dependent on a motion condition of the vehicle, a load condition of the engine, the operation condition of the engine, a condition of a coolant and a capacity of the catalytic converter.

2. (Original) The exhaust-heat recovery system according to claim 1, wherein the incremental control on the combustible components is such that the amount of unburned hydrocarbon in the exhaust discharged from the engine is increased.

3. (Original) The exhaust-heat recovery system according to claim 1, wherein the incremental control on the combustible components is performed when the vehicle is at rest but the engine is still in operation.

4. (Previously Presented) The exhaust-heat recovery system according to claim 1, wherein the prescribed heating condition is specified by at least one of a temperature of the heat-transfer medium, a demand for an increase in heating power of the air conditioner, and an exchanged heat quantity in the exhaust heat exchanger.

5. (Previously Presented) The exhaust-heat recovery system according to claim 4, wherein the temperature of the heat-transfer medium is measured at, at least one of a heat-transfer medium channel from the engine to the exhaust heat exchanger, a heat-transfer medium channel from the exhaust heat exchanger to the heat exchanger, a heat-transfer medium channel from the heat exchanger to the engine, a heat-transfer medium passage within the engine, a heat-transfer medium passage within the exhaust heat exchanger and a heat-transfer medium passage within the heat exchanger.

6. (Original) The exhaust-heat recovery system according to claim 4, wherein the demand for an increase in heating power of the air conditioner is outputted from the air conditioner on the basis of at least one of the difference between a target temperature in the vehicle set by an occupant and an actual temperature in the vehicle or an actual temperature outside the vehicle, and a target temperature of an air conditioning wind at an outlet thereof.

7. (Original) The exhaust-heat recovery system according to claim 4, wherein the exchanged heat quantity in the exhaust heat exchanger is calculated from at least one of the difference between a temperature of the heat-transfer medium at an inlet portion of the exhaust heat exchanger and that at an outlet portion of the exhaust heat exchanger, the difference between a temperature of the exhaust at an inlet portion of the exhaust heat exchanger and that at an outlet portion of the exhaust heat exchanger, the difference between a volumetric flow rate of the exhaust at an inlet portion of the exhaust heat exchanger and that at an outlet portion of the exhaust heat exchanger, the exhaust volume in the engine, the

exhaust temperature in the engine, the amount of fuel used in the engine, and the amount of air used in the engine.

8. (Original) The exhaust-heat recovery system according to claim 1, further comprising:

a bypass channel along which the exhaust having passed through the catalytic converter passes bypassing the exhaust heat exchanger;

a main channel along which the exhaust having passed through the catalytic converter passes through the exhaust heat exchanger; and

an exhaust channel switching valve for closing either the bypass channel or the main channel.

9. (Original) The exhaust-heat recovery system according to claim 1, wherein the exhaust discharged from the engine passes sequentially through the catalytic converter, the exhaust heat exchanger and a muffler toward the downstream side of the engine, and then is discharged into the air.

10. (Previously Presented) The exhaust-heat recovery system according to claim 1, wherein the heat-transfer medium flows out of the engine, and then passes sequentially through the exhaust heat exchanger and the heat exchanger, and returns to the engine.

11. (Previously Presented) The exhaust-heat recovery system according to claim 1, further comprising:

a bypass channel along which the heat-transfer medium is directly delivered bypassing the exhaust heat exchanger from the engine to the heat exchanger;

a main channel along which the heat-transfer medium passes through the exhaust heat exchanger; and

a medium channel switching valve for closing either the bypass channel or the main channel.

12. (Previously Presented) The exhaust-heat recovery system according to claim 1, further comprising:

an oil warmer configured to generate the heat exchange between the heat-transfer medium and a transmission lubricant on the downstream side of the heat exchanger.

13. (Previously Presented) The exhaust-heat recovery system according to claim 12, further comprising:

a bypass channel along which the heat-transfer medium passes bypassing the oil warmer;

a main channel along which the heat-transfer medium passes through the oil warmer; and

a warmer switching valve for closing either the bypass channel or the main channel.

14. (Previously Presented) The exhaust-heat recovery system according to claim 1, wherein the prescribed heating condition is a minimum temperature of a coolant.

15. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine a state of operation of the engine, wherein the state of operation of the engine is selected from the group consisting of the engine being in operation and the engine being at rest; and

upon a determination of the state of operation of the engine, (i) perform the incremental control if a determination is made that the engine is in operation, and (ii) prevent performance of the incremental control if a determination is made that the engine is at rest.

16. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine whether the engine is loaded; and

prevent performance of the incremental control if a determination is made that the engine is loaded.

17. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine whether the engine is unloaded; and

perform incremental control if a determination is made that the engine is unloaded.

18. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine whether the temperature of the coolant is at a temperature selected from the group consisting of higher than, less than and equal to a prescribed temperature; and

(i) if a determination is made that the temperature of the coolant is less than the prescribed temperature, permit incremental control, and (ii) if a determination is made that the temperature of the coolant is higher than or equal to the prescribed temperature, prevent incremental control.

19. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine whether there is a demand for an increase in heating power of the air conditioner; and

(i) if a determination is made that there is a demand for an increase in heating power, permit incremental control, and (ii) if a determination is made that there is no demand for an increase in heating power of the air conditioner, prevent incremental control.

20. (New) The exhaust-heat recovery system according to claim 1, wherein the engine controller is configured to:

determine whether a flow rate of the exhaust is larger than, less than or equal to a prescribed flow rate; and

(i) if a determination is made that the flow rate is larger than or equal to the prescribed flow rate, prevent incremental control, and (ii) if a determination is made that the flow rate is less than the prescribed flow rate, permit incremental control.

**REMARKS**

Prior to this paper, claims 1-14 were pending. By this paper, Applicant adds claims 15-20. Therefore, claims 1-20 are now pending.

Support for new claims 15-20 may be found, among other places, at pages 9-13 of the specification as originally filed.

Applicant respectfully submits that the present application is in condition for allowance for at least the reasons detailed in the Response of September 22, 2006, those reasons being incorporated herein in their entirety. Applicants note that all new claims depend from claim 1, and thus are allowable for (i) the reason that claim 1 is allowable, and (ii ), that the cited references do not render the subject matter of the new claims anticipated or obvious.

**Conclusion**

Applicant believes that the present application is now in condition for allowance. Favorable consideration of the application as amended is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

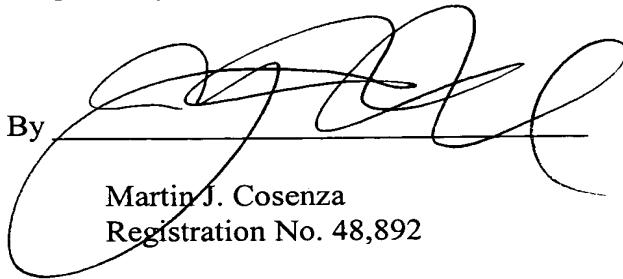
Examiner Edwards is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

Date Nov 03, 2006

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By

A handwritten signature in black ink, appearing to read "Martin J. Cosenza".

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